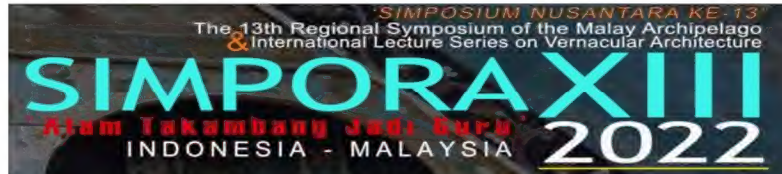




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THE FRAMEWORK FOR DISMANTLING AND REINSTALLING WORKS OF MALAY TRADITIONAL TIMBER BUILDINGS BASED ON MALAYSIAN CASE STUDIES

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Abstract: The traditional Malay timber-built construction techniques, including houses, palaces, gazebos (*wakaf*) and mosques, can be dismantled and reinstalled. The timber building reinstallation ritual called '*angkat rumah*' or '*pindah rumah*' was a common social activity among the Malay community in old times. But today, this practice is intended to be a conservation approach to heritage which relocate it to a more appropriate site. The know-how of traditional timber construction is being forgotten, making the reinstallation work of the buildings something new to modern contractors. It is the issue when dismantling and reinstalling traditional timber buildings is also a process to understand the building's original construction techniques by modern builders that took longer timeframe than expected, especially since the work was carried out without the supervision of a knowledgeable traditional craftsman. On-site discussions often determine the most appropriate work method to be implemented as long as dismantling, sorting, storing, tagging, and reinstalling affect the project timeframe and budget. This case study research involves several observation and interview surveys on local reinstallation projects to collect information about typical work procedures. The research outcome is a framework that potentially becomes a future standard of operation for dismantling, moving and reinstalling Malay timber buildings in Malaysia.

Keywords: Conservation; Malay Timber Building; Marking; Dismantle; Moving.

1.0 INTRODUCTION

The ability of the Malay traditional building can be dismantled and reinstalled to relocate is due to the building materials, the local knowledge and the influence of old Malay culture. (Gibbs et al., 1987; Killmann et al., 1994; Nasir, 1985; Norhasandi Mat, 2010; Yuan, 1987). Parent's houses are usually inherited by several heirs who already have families and live in different places. Its modular building system allows a large Malay house to consist of several blocks that can be detached to convert into several small houses, possibly to be divided for several new owners on different sites. While later, the small house can be extended or attached to another block. The design and selection of construction materials in heritage buildings in Malaysia, significantly its traditional buildings, are strongly influenced by tropical weather factors and the local natural environment. This cultural need has been adapted to the traditional building of a place. The old Malays manipulated the timbers that were easy to work with and converted them into the components of the building to dismantle and reinstall. This construction

technique allows the building to be separated into specific parts and relocated. The culture of the Malay community that inherited the wealth of previous generations made the ritual practice of moving buildings last for a long time until a certain period and was gradually forgotten before modern buildings took place. (Killmann et al., 1994).

In old Malays, cultural ritual is performed either fully or partially dismantling a building or house which intended to be moved. Partial dismantling is usually practised to reduce the weight of the house so that it can be lifted to move with manpower. Houses completely lifted using manpower are known as the customary practice of '*angkat rumah*' or '*pindah rumah*', commonly practised for small ones and relocation within a short distance (Yuan, 2002). However, rare cases, such as heritage Mosques and palaces, have undergone reinstallation at a new site in Malaysia. The common practice of reinstalling a traditional building built from timber involves the basic process of dismantling, transporting, repairing or replacing, and reinstalling at a new location with minor new components as a replacement of damaged ones (Killman et al., 1994).



Figure 1: lifting to shift the Malay house by manpower in Kampung Baru, Bota Kanan, in Perak State
Source: Faazawanz (2018)

According to ICOMOS, dismantling to reinstall a traditional building common practice in several Asian countries has been considered a conservation work approach since the Nara Document of Authenticity was declared in 1994 (Henrichsen, 2004). Today in Malaysia, the relocation of the traditional building is more of an action to save the building rather than a cultural ritual because it is more intent on safeguarding the cultural, historical and aesthetic values. It is increasingly appreciated due to the extinction of traditional builders. Ampang

Tinggi Palace in Negeri Sembilan is among the earliest heritage building in Malaysia that had been moved to a new place in the 1950s for such intention (Md Ali, 2016).

2.0 THE MALAY TIMBER BUILDING RELOCATIONS IN MALAYSIA

Dismantling and reinstalling Malay timber buildings to relocate at a new site is almost the reverse process of new construction, while reinstallation involves a proper order of building members as original construction (Gibbs et al., 1987; Killmann et al., 1994). The first Malay traditional building that was restored, led by Sheppard is Ampang Tinggi Palace, where a derelict old Malay palace turned into the Negeri Sembilan State Museum in 1953 (Zuraini Md Ali, 2016). It is also the first adaptive reuse of old Malay traditional buildings recorded in Malaysia. Around ten years later, the conservation of the Kelantan royal building by Sheppard Istana Tengku Long Palace, also known as Tele House (*Rumah Tele*) (Zuraini Md Ali, 2016). The Kampung Laut Mosque (*Masjid Kampung Laut*), which faced severe riverbank erosion in 1966, is Malaysia's earliest recorded conservation project that involves relocating work to safeguarding.

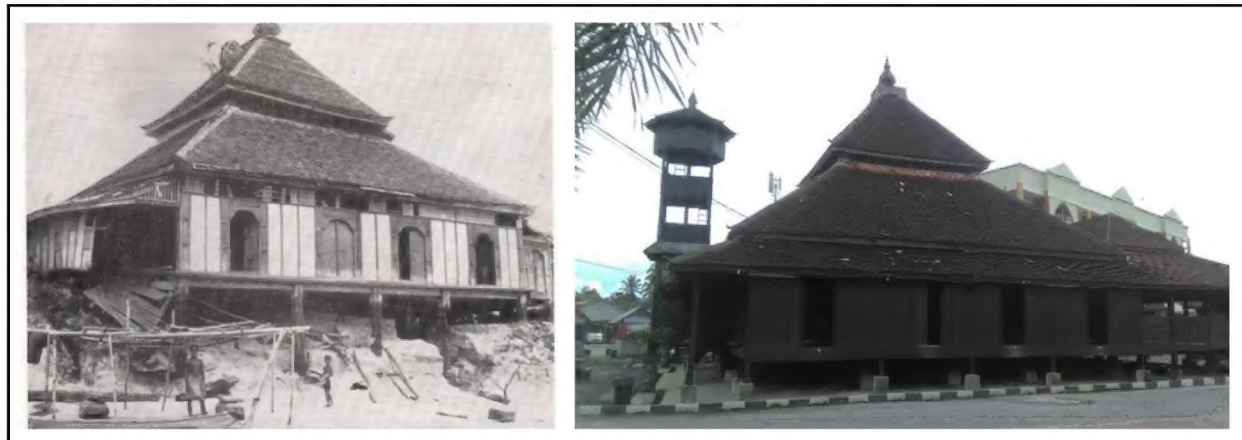


Figure 2: The old picture of the mosque at the original site in 1966 after the banks of the river were eroded by heavy floods(left) .Source: Akib (2003) and the mosque is well preserved at its new location (right). Source: Author (2017).

The Rumah Penghulu Abu Seman (Penghulu Abu Seman House) is one of the oldest surviving traditional Malay houses. The house was built between 1910 and the early 1930s, and it was owned by the local headman of Mukim Bagan Samak, Bandar Baharu, Kedah. Originally located in Kampung Sungai Kechil, a small village in the northern part of Peninsular Malaysia, it was rescued, relocated and restored (1996-1997) by Badan Warisan Malaysia. Today, it is one of the finest remaining examples of Malay vernacular architecture. It is located in the heart of Kuala Lumpur.

Bugis house, also known as the Red House, was owned by a Bugis chieftain (*penghulu*) and was built around the early 1900s. The traditional timber house was erected and decorated with features and elements of the Bugis ethnic identity. The initiative aims to rescue, restore and relocate the house from Kampung Permatang, Kuala Selangor, to the grounds of the Sultan

Alam Shah Museum in Shah Alam, Selangor. The ten months project was completed on 27 April 2016 (Ahmad, 2017).



Figure 3: The Bugis house in 2014 was left abandoned (left), and the same house after reinstallation work was completed (right).

Chow Kit House, also known as Sutan Puasa House, is a traditional Malay house built in 1926 in Jalan Chow Kit. This house was once owned and built by Jaafar Sutan Sinomba, also known as Sutan Mengatas Sutan Sinomba, one of the founders of Kuala Lumpur. This house is an example of a modern house of the 1920s era in Kuala Lumpur which represents a local value of architectural and historical significance. Due to its historical significance, the house was dismantled and relocated to a new site within the compound of the National Art Gallery in 2018 (Bharian.com.my, 2019).



Figure 4: Old picture of the Chow Kit House (left) and reinstallation work in progress in the year 2018 (right).

Source: Author

The Old Mosque of Kampung Teluk Memali in Kampung Gajah, has historical significance associated with the time of Sultan Abdul Malik Mansur Shah and the British colonial in Perak

(Zulkarnain, 2019). The reinstallation work to the mosque in 2016 has been relocated to a new site in Ipoh, Perak. Based on historical studies, the mosque built before 1900 was moved to the same village in 1910 due to often flooding from river overflow and the risk of riverbank erosion (Mamat, 2018). A visit to the new site in 2019 found that the relocation work was fully completed retaining the original local design features and uses as the original function. In Malaysia, originally in the old days, the purpose of dismantling and reinstalling the building by Malays is due to the new place of settlement and the development of family members due to marriage. But today, the reinstallation of heritage buildings in Malaysia is widely practised to safeguard valuable buildings. At one time, the building was built at the original place to suit the needs of the current time. Still, the time changes caused the area to be increasingly abandoned for several reasons, such as economic development, social factors, and natural disasters.



Figure 5: Kampung Teluk Memali Old Mosque found in the original site before reinstallation (left)Source: Zulkarnain (2019) and the mosque at the new site after reinstallation work in 2018 (right). Source: Author, 2018

3.0 ISSUES ON MALAY TIMBER BUILDINGS

For the past few decades, traditional Malay buildings have become extinct due to the inclusion of modern technologies in construction. Besides, the decreasing local timber supply causes rising prices of this natural material, making restoring the derelict traditional building the best solution rather than building new ones. Besides, the local land developments and topography changes have caused many heritage buildings to be set aside. Fortunately, the traditional timber buildings in Malaysia can be dismantled to be temporarily stored or directly reinstalled at another site, unlike most masonry heritage buildings.

Dismantling and reinstalling work is needed to relocate the building to a more secure and appropriate site. It is an approach to extend the timber building's life so that the cultural values can be maintained for historical evidence of present and future reference (Kamal, Ab Wahab, & Che Ahmad, 2004; Siti Norlizaiha Harun, 2011). The changing times that lead to local development, ownership issues and the safety of building sites lead to the decision for a building to be moved or kept temporarily in another place as the best option. Saving this heritage through relocation work involved three main phases; dismantling, transporting, and

reinstalling, where the basic principle applied in this work is marking with a particular cording system to indicate the component position and the construction sequence (Brown, 2013; Killman et al., 1994; Masuda, 1971; T. Park, 2015). The Malaysian conservators applied their rational method of marking in dismantling to reinstall the building at the new site. So far, no marking system for reinstallation has been released for standard guidance. Most of the reallocating of a traditional building done in Malaysia is uniquely marked on each building component, where most international experiences suggest this method. The marking system helps the builder during dismantling and reinstalling because these two processes are impossible to run simultaneously due to the traditional timber construction system. The dismantling work of the Malay building is a reverse process of its construction. Meanwhile, reinstallation can only be done when all or most of the building has been detached (Killman et al., 1994). Therefore, the marking is an essential temporary record between the two work stages.

Based on Malaysia National Heritage Department, About 50% of traditional timber buildings in Malaysia that have been conserved from 1977 to 2017 are undergone dismantling and reinstalling works where most of their original sites have experienced high development pressures apart from topographic factors (Muhammad et al., 2017). Most parts of the world have accepted dismantling and reinstallation as one of the conservation approaches. But the standard project implementation framework is still debated even though many are successful. The standard operation in this conservation approach needs to reach a national declaration so that work can be assessed and the record of heritage values on the building can be easily referred to in future.

Dismantling and reinstalling approach to heritage building is uncommon in Western countries as most of their heritage buildings are built to remain on site. On the other hand, the practice of reinstallation and relocation is a practice that is part of cultural values and beliefs in certain Asian countries such as Malaysia, Indonesia, Thailand, and Japan. (Brown, 2013; Orbasli, 2008; Yeomans, 2008). In Japan, their shrines and temples are dismantled to restore as their religious ritual purposes. While in Malaysia, traditional buildings are relocated due to inheritance reasons. The different intention causes the need for a standard dismantling and reinstallation of the timber building framework for Malaysia's context.

4.0 THE DISMANTLING AND REINSTALLING FRAMEWORK

Several projects of relocating the traditional timber building in Malaysia have been selected as case studies for this research aimed at obtaining the Dismantling and Reinstallation Work of the Malay Timber Building Framework. The observation, interview and document survey is conducted in the research. The typical work stages are identified to form the proposed framework. The typical work is the work process that has been carried out in almost all case studies. The framework is addressed in the diagram in Figure 6.

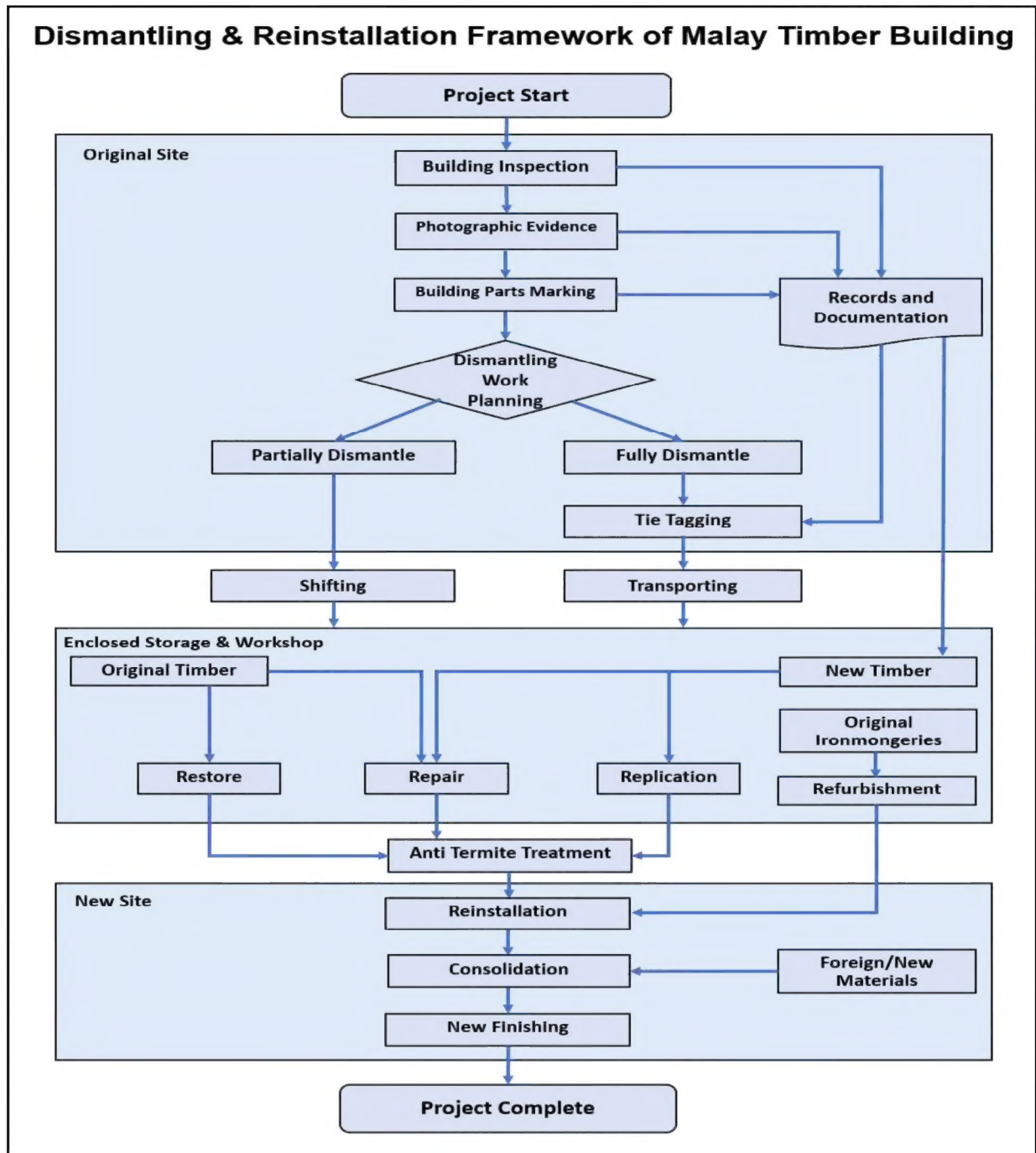


Figure 6: The proposed Dismantling and Reinstallation of Malay Timber Building for the Malaysian context.

At the beginning of projects, clearance is carried out in dereliction sites for easy access. Detailed photographic data are collected for evidence and for the reinstallation work reference that will be conducted. The photographic data is also significant for recording the building's original surrounding setting since the building will be relocated to a new site. Next, the building's physical investigation is carried out to collect information on the level of damage and

ensure the respected building can be dismantled and restored. Although the traditional Malay timber building can be dismantled, the building may have undergone consolidation with additional modern nails, making it a fixed structure. This will make the work more difficult and possibly lead to much damage to the building members. In addition, the investigation is to identify the level of dilapidation of the building, where this information roughly determines the restoration cost of the building. The volume of new timbers to replace the building's members that have been damaged or lost can also be estimated. The original building design and previous renovation, addition or modification are identified to determine how worthwhile the building is if it is restored. Information about the existing damages, constructed materials, including timber species inventory, the architecture with its ornamentation, and the surrounding setting are recorded for conservation purposes.

A measured drawing is carried out to get the dimension of the building accurately as a record, but more importantly, it is used to plot the coding on each building member. The code marking on the building members ensures that the contractor can identify what element and the correct position should be reinstalled. Component tagging is according to building elements and their sequence in construction (T. L. Park, 2013). The common method practised in Malaysia is to mark each dismantled component with a combination of alphabets and numbers so that it can be referred back to reinstall according to the original position and sequence. However, there is no standard reference for the marking system. Based on the observation survey on the case studies, the coding scheme based on building elements such as roofs, doors, windows etc., is marked with an alphabet (short form). Next, each element's members are marked with numbers according to their sequence in the existing position.

Based on surveys, there are two methods of moving and dismantling buildings which is also a common practice in Malaysia. For small buildings such as typical houses and to move within a short distance, manpower is used to carry the house. This method is a traditional technique that was practised a long time ago with certain rituals. This ceremony is part of the culture in Malay life. But today, for safeguarding reasons, the building is sliding to shift using a special mechanism and track prepared along the moving path. The building is partially dismantled to reduce its weight of the building so that it can be easily shifted. The non-structural element is dismantled: the walls, doors, windows and floorboards. At the same time, the building's main structure and roof remain. Roof elements are left intact throughout the project conducted to protect the remaining parts of the building from rain. In comparison, the total dismantling of the building parts is carried out if the building needs to be transported by road. These methods are implemented for massive buildings and long-distance relocation. All building parts that have been dismantled and stacked are indicated with tie tagging reflecting the codes that have been marked on every component before. Tie tagging helps to refer to the detached for sorting and selecting the building parts that arrived at the new site.

Meanwhile, the new site is prepared to receive the building. The new site topography should match the original site. The column stump in a Malay building, usually made from stone or concrete, is constructed based on the measured drawing. The enclosed area is built near the building's new location. The area is to store the dismantled building parts and receive new

timber to ensure that the timbers are protected from the weather. Based on the early dilapidation reports, new timber is ordered based on the quantity of the original timber that has been damaged. The workshop for restoration, repair and replication of the building parts is conducted under the same enclosure. The termite treatment on the timber parts and the refurbishment of the original ironmongeries are carried out to be reinstalled. Ideally, the termite treatment applied to the component before it is reinstalled is more effective because it can be applied to every side of the component compared to the assembled member.

The reinstallation work starts with the building's main structure and roof structure, followed by other non-structural elements. The building underwent partial dismantling, where the main structure remains intact; the reinstallation work proceeded with the joist and floorboards first. In historic timber building conservation, reinstallation always reflects the original building. At this stage, the recorded data, such as measured drawings and the collected pictorial evidence, is referred to. However, some buildings that moved need to add a consolidation element to increase their strength and rigidity. Some buildings have changed from their original function (adaptive reused) and need to undergo consolidation because they are expecting to receive more loads than before. Consolidation usually involves foreign materials than the original (Feilden, 2003). Based on the case studies, the consolidation involves using steel structures and additional timber that match the existing species or at least the same in strength groups.



Figure 7: Consolidation by steel braces on the columns of Istana Satu, which was once reallocated to the National Museum compound.

Source: Author (2019).

After the reinstallation work is completed, the temporary component marking is cleaned to receive the new coating (finishing). In a particular area not exposed, such as under the raised floor, the reinstallation marking remains as work evident in the future. The new coating proposed is always modern to ensure long-lasting protection for the timbers, but the colour selection that matches the original is the first choice. The timber coating that exposes the timber grain pattern is most popular in traditional buildings in Malaysia. Finally, is to label the

repaired and replicated parts for future reference on the building with a coding scheme that contains the information on the work done and the completion date.



Figure 8: The members below the raised floor marking left to remain as work evident and for future reference.

Source: Author (2020).

4.0 CONCLUSION

Based on the Malaysia National Heritage Department (2017), the proposed conservation concept is a global practice. As much as possible, preservation stresses the authenticity of the building materials, architecture, construction techniques and surrounding setting. However, in the case of the relocation of the heritage building, most of the original surrounding setting had to be sacrificed for the sake of safeguarding the building itself. Therefore, written and photographic records of the original site are essential documents. This documentation should be stated in the framework for dismantling and reinstalling traditional timber buildings, especially in Malaysia.

Basically, relocating the timber building requires three main phases of work such as dismantling, transport, and reinstallation (Killmann et al., 1994; Md Ali, 2016; Yuan, 2002). The respective contractor should detail these three phases of work to suit the building's condition and the work situation on site. The allocated budget also determines the work method that will be implemented. However, typical work stages have been identified and presented in this research paper to form the proposed framework (Figure 6). In order to facilitate record keeping as a reference for future generations, a standard framework developed based on the local context has been proposed. The standard framework also helps in evaluating to measure the success level of projects that have been completed.

In Malaysian practice, private buildings which are not gazetted as local heritage buildings are not strictly subject to complying with The Malaysian Building Conservation Guidelines and The National Heritage Act. However, it is good to refer to this framework for reasons of awareness and respect to the heritage values embedded in the buildings.

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